

Comparisons of Plant Quality among Large Production Nurseries

Mid-Term Report

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Introduction

The purpose of this research project is to compare plants from different production nurseries in order to determine the quality of these plants. Plants of poor quality tend to have broken or improperly pruned branches and serious root defects that result from poor production methods. For this study we determined which defects or problems were present in individuals of two popular landscape plants, *Pinus mugo* and *Acer palmatum*, obtained from three local nurseries and whether materials from one nursery differed from the others in degree of quality. We chose these two species because of their popularity in the landscaping industry as well as their relative obscurity in scientific literature with regards to quality assessment.

Work Done

To date, we have purchased and analyzed for quality 30 individuals, 10 apiece from each nursery, of *P. mugo* 'Pumilio' and 30 individuals of *A. palmatum* (10 'Sango kaku,' 10 'Winter Flame,' and 10 'Red Wood,' each cultivar from a different nursery). From our understanding, the *A. palmatum* cultivars 'Winter Flame' and 'Red Wood' are derived from 'Sango kaku' individuals that displayed enhanced bark coloration during the fall and winter seasons and were deemed by us to be similar. Since this project was scheduled to begin in the late summer, long after peak sales in spring had depleted the quantity and selection of plants, we found it difficult to obtain the number of plants originally proposed for this project.

Once the plants were obtained, we recorded the presence or absence of defects and problems for each individual plant and ranked the overall quality of belowground (root) structures. For *A. palmatum* only, we ranked the overall quality of aboveground (trunk and branch) structures as we were unable to find ranking criteria for *P. mugo*'s growth habit. For a complete list of the attributes examined and their presence or

absence, please refer to Table 1. For definitions of ranking criteria and the average ranks for each nursery, please refer to Table 2.

Results

Statistical analyses were performed to verify whether differences existed between nurseries in the frequency of occurrence of specific problems of defects. Frequency of occurrence was compared using the log-likelihood ratio of contingency tables. Attributes with at least one nursery group different from the others were partitioned into 2x2 contingency tables to examine potential differences between subsets of nurseries. The rankings of aboveground and belowground structures for each nursery were compared with the Kruskal-Wallis Test. The significance level was set at 0.05 for all analyses performed.

We have yet to fully interpret the results of our statistical analyses and cannot fully comment on the significance of their results. However, you will find in Tables 1 and 2 a summary of the unanalyzed results.

Current Work

We are currently working on the interpretation of our statistical analyses and the creation of a publishable draft report of the results. With regards to the 'Project Schedule' submitted with our proposal, we are on schedule and will have a report generated and ready for publication by the end of March 2005. Once the report is completed, we will submit the report to the Washington State Department of Agriculture and will submit the report to a scientific journal for review when deemed appropriate.

I would like to thank the Washington State Department of Agriculture for giving us the opportunity to perform this study. The funding has provided us with the ability to obtain materials and concentrate exclusively on its completion in a timely fashion.

Thank you.

Table 1. The degree of presence of plant quality problems among *P. mugo* 'Pumilio' and *A. palmatum* cultivars.

Plant Quality Problems	<i>P. mugo</i> 'Pumilio'	<i>A. palmatum</i> cultivars
Insect pests/disease	Absent	Absent
Greater than 5% canopy damage from pests/disease	Absent	Absent
Presence of weeds	Partially Present	Partially Present
Inappropriate container size	Absent	Absent
Height < minimum height specified for tree	NA	Absent
Suckers/water sprouts	Absent	Absent
Lack of strong central leader/multiple leaders present	Present	Present
Leader removed	Absent	Partially Present
Taper not present in trunk	NA	Absent
Presence of included bark or narrow crotch angles (precursor)	NATD	Partially Present
Greater than 40% of trunk free of branches	NA	Absent
Broken branches	Partially Present	Partially Present
Major branch crossing major branch or trunk	Partially Present	Partially Present
Dieback within branches (not indicator of degree of dieback)	Partially Present	Partially Present
Greater than 5% tip dieback of branches	Absent	Absent
Branch stubs left beyond branch collar	Absent	Partially Present
Flush cuts from pruning branches	Absent	Absent
Removal of apical buds	Partially Present	Absent
Pruning scars	Absent	Absent
Non-pruning scars	Partially Present	Partially Present
Crown thin and sparsely foliated	Absent	Absent
Abnormal foliage color	Partially Present	NATD-leaf senescence
Leaves smaller than normal	Absent	Absent
Deformed leaves	Absent	Absent
Roots not filling pot	Absent	Partially Present
Excessively root-bound in current container	Absent	Absent
One or more roots outside of container	Absent	Absent
Uneven distribution of roots within root ball	Partially Present	Partially Present
Kinked roots	Present	Partially Present
Circling roots	Present	Partially Present
Root defects located within internal upper half of root ball	Present	Partially Present
Root defects located within outer upper half of root ball	Partially Present	Partially Present
Root defects located within lower half of root ball	Partially Present	Partially Present
Root defects uncorrectable	Partially Present	Partially Present
Roots root-bound in previous containers	Partially Present	Partially Present
Plants repotted at an angle in larger containers	Partially Present	Absent

Present=Present in all individuals examined for all three nurseries

Partially Present=Present in at least one but not all individuals examined (problems deemed as partially present were further analyzed for differences between nurseries)

Absent=Absent in all individuals examined for all three nurseries

NA=Not applicable

NATD=Not able to determine

Table 2. Mean ranking of the overall quality of aboveground and belowground structures for *P. mugo* 'Pumilio' and *A. palmatum* cultivars.

	Root Quality			Trunk Form			Branch Arrangement			Structural Uniformity of Crown		
Nursery	1	2	3	1	2	3	1	2	3	1	2	3
<i>P. mugo</i> 'Pumilio'	4.0	3.4	3.9	--	--	--	--	--	--	--	--	--
<i>A. palmatum</i> cultivars*	3.5	2.8	2.8	2.2	2.9	2.6	2.2	2.0	2.7	2.2	1.8	1.4
Rank Definitions	1=No kinked or circling roots; not root-bound 2=Few kinked or circling roots easily corrected 3=Moderate root defects correctable with major pruning 4=severe kinked and/or circling roots not correctable or so numerous that removal would be detrimental			1=Single straight trunk with < 5° bow 2=Trunk fork in upper half of tree; 5-15° bow 3=Trunk forks in lower half of tree or 3 or more trunks in upper half of tree; > 15° bow; trunk has a dogleg 4=3 or more trunks in lower half of tree			1=No vertical branches; no branch equally dominant to leader 2=All branches equally dominant with no branch tips taller than trunk 3=Most branches vertical 4=Vertical branching with narrow branch angles; major branches growing from same point or opposite from each other			1=Branches evenly distributed around trunk 2=Most branches evenly distributed with up to one major branch located directly above another 3=Branches not evenly distributed; several branches growing on same side; 2 or more branches directly above each other 4=Tree is one-sided or flat sided; major branches growing from only one or two sides		

*Cultivars obtained from each nursery are: Nursery 1-'RedWood' Nursery 2-'Winter Flame' Nursery 3-'Sango kaku.'